SECTION 18 - WASTE MANAGEMENT

18.1 INTRODUCTION. This section addresses the waste generated at DOD medical facilities, and establishes design guidance for the collection, transportation, holding, disposal, and treatment of these wastes. Wastes not addressed by this section include asbestos, nuclear, and water-borne (sanitary) wastes. This section discusses, but does not provide complete facility design guidance for, soiled reprocessable materials, such as linens, uniforms, etc..

18.1.1 Regulations, Codes, and Standards. The design of the waste management system shall be in accordance with the Federal regulations listed in the references (18a through 18g) at the end of this section. In addition, the design shall be in accordance with State and local government regulations. Guidelines and advisory standards available from the National Fire Protection Agency (NFPA), the Centers for Disease Control (CDC), National Institute for Occupational Safety and Health, (NIOSH), Department of Health and Human Services (HHS), and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), shall be utilized as applicable and considered minimum criteria for facility design. Specific publications of these agencies are cited periodically throughout this text to emphasize applicability.

18.1.2 Waste Categories. Each of the several categories of medical facility waste requires individual design consideration of handling, storage, and disposal by the facility. In addition, regulatory requirements differ for each category, dependant upon the relative personnel and public hazards and environmental impact.

18.1.2.1 Non-regulated Medical Waste (NRMW). This waste category includes those wastes not classified as Regulated Medical Waste (RMW), Recyclable Materials (RM), or Hazardous Waste (HW). NRMW normally constitutes no special danger of infection or injury to personnel or the general public.

18.1.2.2 Regulated Medical Waste (RMW). RMW is waste which poses danger of disease transmission and/or objectionable appearances to the public and handling personnel, and includes the following, as defined by reference 18a:

a) Cultures/Stocks of Infectious Agents;
b) Pathological Wastes;
c) Human Blood and Blood Products;
d) Used Sharp implements;
e) Contaminated Animal Wastes and Bedding;
f) Isolation Waste from Patients with Highly Communicable Diseases;
g) Unused sharp implements;
h) Human surgery specimens or tissues removed at surgery or autopsy.
i) Used, absorbent materials saturated with blood, blood products, body fluids, or excretions or secretions contaminated with visible blood; and absorbent materials saturated with blood or blood products that have dried ("band aid" type dressings are normally not included in this category).
j) Non-absorbent, disposable devices that have been contaminated with blood, body fluids or, excretions or secretions visibly contaminated with blood, but have not been treated by an approved method.
k) Other Wastes mixed in with the above.

18.1.2.3 Recyclable Materials (RM). RM are those used materials which can be reused, either for the same purpose as the original material or, following processing, in a different form or for a different purpose. RM normally constituted no special danger of infection or injury to personnel or the general public.

18.1.2.4 Hazardous Waste (HW). HW is defined by the Resource Conservation and Recovery Act (RCRA), Subpart C (and categories not de-listed at Subpart D), contained at 42 USC 6973, 40 CFR 261-265 (reference 18b), and constitutes wastes having ignitable, corrosive, reactive, or toxic characteristics.

18.2 GENERAL DESIGN REQUIREMENTS. The proper design of a medical facility waste management and handling system requires consideration of the operational and mission characteristics of the facilities, the existing waste disposal practices of the facility or base/post, the governmental regulations affecting the design, and the costs and application of system handling and disposal technologies. It is the designer's responsibility to identify the characteristics and volumes of facility-generated wastes and to design the facilities necessary for collection, holding, segregation, and ultimate disposal of the wastes. The waste management system shall be designed to help maintain aseptic environments in the hospital, and to minimize or eliminate physical and infection hazards to patients, hospital staff, and the general public, at the lowest reasonable cost to the government.

18.2.1 Waste Management Study (WMS). A WMS shall be executed for each facility design. The study shall constitute the design project documentation of all considerations and conclusions of the waste system design. In addition to a narrative description of the proposed waste management methodology, the study shall include the following:

(a) Determination of the waste stream components and soiled linen types.
(b) Estimation of waste and soiled linen volumes.
(c) Concepts for segregation, holding at the generating departments and central bulk holding.
(d) Space and utility requirements for departmental holding rooms.
(e) Concepts for the collection and transportation of the waste and soiled materials through the facility.
(f) Soiled dock arrangement, layout, and equipment.
(g) Waste Management Center (WMC) space, layout, equipment, and support utility requirements.
(h) Concepts for the disposal of each waste category.
(i) Life Cycle Costing (LCC) Studies for RMW processing equipment.
(j) Aspects of RMW processing; operation and maintenance, safety, infection control.

18.3 WASTE MANAGEMENT SYSTEM FACILITY SPACE REQUIREMENTS.

18.3.1 Departmental Solid Waste Holding. Each category of waste, and soiled materials, shall be held separately from clean materials and segregated to prevent cross-contamination. The design shall determine the space requirements for holding areas at the generating department level. Space requirements for holding rooms shall take into account the necessary space for personnel and cart circulation, the categories and volumes of wastes and soiled materials generated on the individual departmental basis, and the schedule of removal.

18.3.1.2 RM Segregation. RM shall be segregated at the generating source. Appropriate space for RM holding containers in patient rooms, clinical unit nursing stations, offices, ancillary areas and support departments is required.

18.3.1.3 Collection Schedule. Design of the waste and soiled linen systems shall be based upon the completion of all collection tasks within one (1) working shift of eight (8) hours for offices, clinics and ancillary areas,

unless other schedule is justified by analysis in conjunction with the Transportation Study addressed at Section 17 of this manual.

18.3.1.4 Typical Nursing Unit Soiled Utility Room. For the general 28 to 36 bed nursing units, a typical soiled utility room will require approximately 18.6 net square meters (200 net ft) in floor area. This typical soiled utility room is shown at Figure 18.1.

18.3.2 Waste Management Center. For hospitals, medical centers, and other facilities generating significant volumes of RMW and/or HW, a centralized Waste Management Center (WMC) should be provided for the facility. The WMC is designed for bulk waste and soiled materials holding and dispatch, and for RMW processing. Provision of a central WMC helps to ensure necessary control over facility waste, and facilitates future changes in waste compositions and volumes which impact space requirements. Bulk holding in the WMC is normally provided for NRMW, RMW, RM, and soiled linen.

18.3.2.1 Holding Capacity. A minimum of three (3) days holding capacity for all waste/soiled materials shall be provided in the WMC, to provide for operational contingencies, such as holiday weekends. Remote facilities, or those with special mission requirements, may require greater holding capacity. Special requirements applicable to HW are addressed elsewhere in this manual.

18.3.2.2 Staff/Administration Space. WMC staff and administrative facilities will be required within or proximate to the WMC.

18.3.2.3 Clean Cart Holding. Holding space shall be provided in the WMC for clean cart holding. Space requirements will be determined in coordination with the Transport Study, which will identify the number and frequency of use of the various cart types. A minimum holding of one (1) hour is required for each separate cart type.

18.3.2.4 Soiled Cart Holding and Cleaning. When in-house RMW processing is required, space shall be provided in the WMC for soiled cart holding, segregated from holding space for clean carts or materials. A cart cleaning station shall also be provided at the WMC, consisting of an automated cart washer or steam gun in a manual cart wash room.

18.3.2.5 Secured Holding. Secured holding with restricted access, designed to meet the requirements of the Resource Conservation and Recovery Act (reference 18a) should be provided for HW. Similarly, a separate secured holding area should be provided for RMW.

18.3.2.6 Emergency Shower and Eyewash. An overhead shower and eye wash station should be provided for employee use in the WMC in the event of contamination by HW or RMW.

18.3.2.7 RMW Processing Equipment. On-site RMW processing equipment is normally located in the WMC.

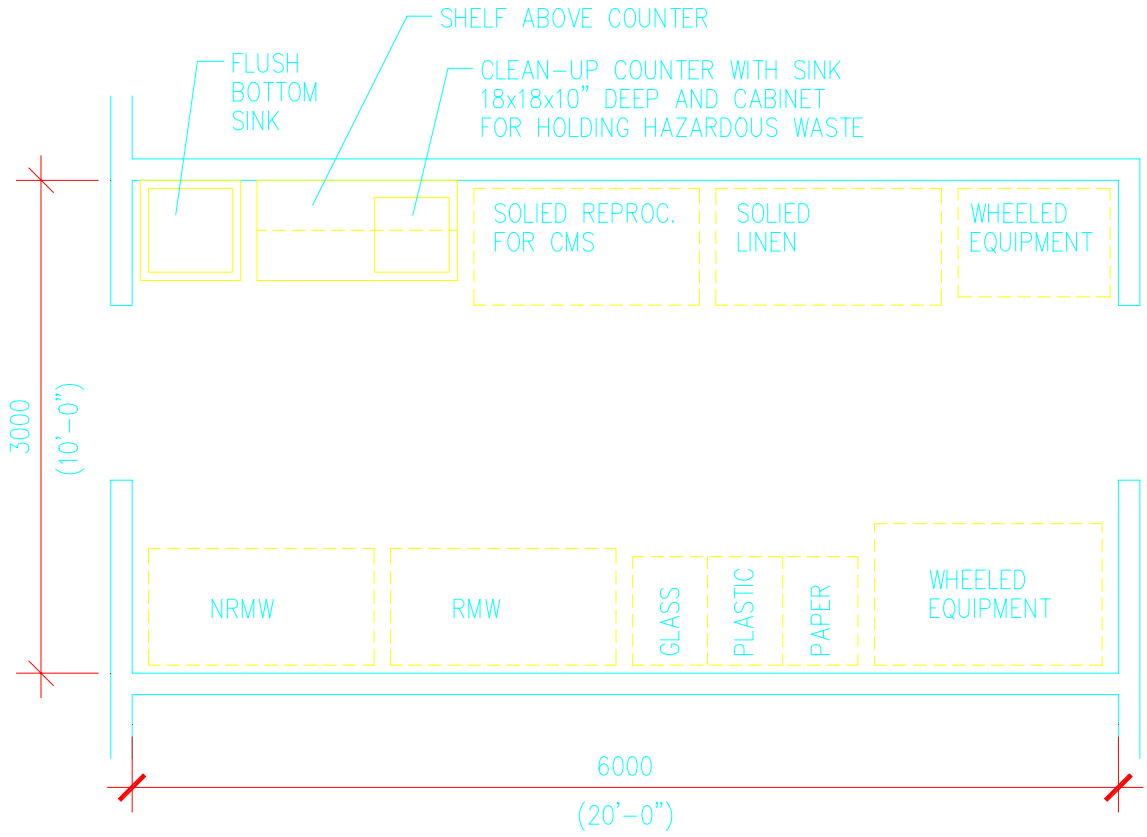
18.3.3 Soiled Dock Design. Soiled docks shall not be used for clean materials receiving or dispatch. The required number of soiled docks shall be determined for each facility. However, the following minimum soiled dock positions are required:

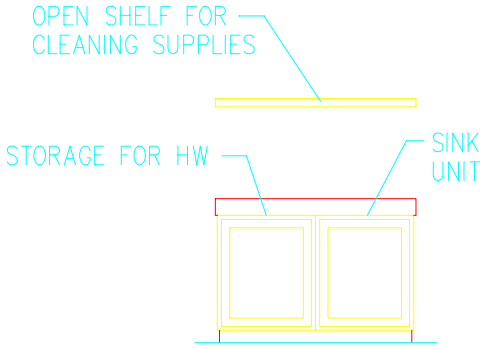
a) One (1) dock position for dispatch of soiled linen, RMW (off-site treated), RM, and HW,
b) One (1) position for the NRMW compactor or roll-off container.
c) One (1) position for the container for treated RMW.
d) One (1) salvage/large item dumpster at or near the soiled dock.

18.3.3.1 Dimensions and Arrangement. The dock height, depth and apron are determined by the WMS, based upon such considerations as soiled dock activities, truck types and dimensions, and cart and personnel movement and circulation.

18.3.3.2 Personnel Access. Appropriate stairs and ramps shall be required to facilitate personnel movement, including accessibility requirements (see Section 12), between the dock and the ground level.

18.3.3.3 Weather Protection. In locations of intemperate climate, ie., high wind, or temperature extremes, enclosed docks are required. In other areas where an outside dock is adequate, a protective canopy shall be provided to shield personnel and materials from rain or snow.





ELEVATION OF CLEAN-UP COUNTER AND SHELF ABOVE

NOTES

1. THIS IS A TYPICAL SOILED UTILITY ROOM FOR A CENTRAL NURSING UNIT OF 28-38 BEDS WITH DOUBLE CORRIDOR ACCESS.
2. A NET SQUARE FOOTAGE OF 200 IS THE MINIMUM RECOMMENDED.
3. ASSUMES NO THRASH OR SOILED LINEN CHUTES.
4. RECYCABLE MATERIAL CAN BE OTHER THAN THOSE SHOWN.

DRAWING IS CONCEPT ONLY AND MAY NOT BE APPROPRIATE FOR ALL PROJECTS.

PLANING DETAILS SCALE: NTS

TYPICAL SOILED UTILITY ROOM FOR A GENERAL NURSING UNIT
Figure 18-1

18.4 WASTE COLLECTION AND TRANSPORT. The waste management design shall be fully coordinated with the transportation design to determine the most appropriate means and routing of transport of wastes within the facility. Automatic or manual systems may be considered. The design shall avoid creating conditions which require or involve the double handling of waste, especially RMW and HW.

18.4.1 Vertical Collection Systems. The extent of use of vertical collection for the movement of soiled linens and NRMW shall be determined in coordination with the transportation design, addressed in Section 17. Vertical collection elements include:

a) Gravity Chutes;
b) Pneumatic Chutes;
c) Conveyors and
d) Elevators.

18.4.2 Restricted Movement Routes. Hospital wastes and soiled materials movement routes shall be designed to avoid public areas and contact with patients.

18.4.3 Containment and Labeling. HW and RMW will be collected in enclosed, leak-proof containers (or bags), properly labeled to identify the nature of the materials. Management of HW shall comply with the RCRA.

18.4.4 Restricted Transport Systems. Chute systems shall not be used for RMW, RM, and HW: these wastes are moved by cart. Liquid borne shredded-waste (NRMW), and institutional vacuum systems, are not recommended.

18.4.5 Manual Collection Methods. Manual collection of waste and soiled materials is generally accomplished by cart. The cart design should be compatible with automatic cart dumping, cart washing and RMW processing equipment (if utilized). Additional guidance for the design of waste transport systems and methodology is provided at Section 17.

18.5 NRMW PROCESSING AND DISPOSAL. The design shall coordinate processing and disposal of NRMW with the existing procedures of the base/post. Waste compaction should be considered to determine cost feasibility.

18.5.1 Automatic Cart Dumper. If NRMW is delivered to the WMC by cart, an automatic cart dumper should be provided to transfer the waste into the holding container or compactor.

18.5.2 Collection Hopper(s). For systems utilizing chutes for transport of NRMW to the WMC, collection hoppers should be provided to load the waste automatically into the holding container or compactor.

18.5.3 Compaction. Compaction is used in conjunction with roll-off containers and the equipment must be compatible with the soiled dock design. Where a separate compactor and container system arrangement is planned, under-dock installations should be used. Compactor location must be compatible with the dock traffic patterns, transporter access, and suitable for physical protection. Compacted NRMW is normally disposed of off-site.

18.5.4 Waste Grinders. Grinders should be provided in Food Service areas, including dish washing, pots/pans washing and food preparation areas. Grinder size will be based upon the maximum number of meals possible at full occupancy. Grinders shall not be used in Obstetrical Suites.

18.5.5 Pulping and Shredding Systems. A pulping/shredding system is normally provided for Food Service Department waste. Food Service waste

includes food preparation waste, packing materials, tray scrapings, paper and plastic plates and containers, trays and utensils, not economically or practically processable as RW. Pulped waste shall not be piped to a remote disposal location, but pulped directly into containers visible to the pulping machine operator. Central systems for general facility NRMW are not normally provided, but may be considered for Using Military Department approval if cost justified.

18.5.6 Incineration. On August 15, 1997, The EPA Administrator final standards and guidelines, CFR 40 Part 60, to reduce air pollution from incinerators that are used to burn medical/infectious waste (MWI) by 75 to 98 percent of levels existing at that time. These final standards supply to "existing MWI's" built before June 20, 1996 and "new MWI's" built after June 20, 1996. Additionally, these final guidelines are for use by States in developing plans to reduce air pollution from new and existing MWI's and are only minimum standards. These revised guidelines mean that any new incinerators will probably be built by large commercial concerns or regional hospital systems, and not individual healthcare institutions.

18.6 RMW PROCESSING. Selection of a treatment or disposal process for a particular location requires careful consideration of current installation practices (as applicable), Federal, State, and Local governmental regulations, and the relative costs, operational complexities, and legal implications associated with the available disposal options. The majority of DOD medical facilities utilize contractor treatment and disposal of RMW, due to economic considerations (including maintenance costs) and uncertainties in local laws or landfill acceptance policies. On-site processing of RMW should be considered only following careful consideration of local regulations, landfill policies for the acceptance of treated RMW, the operating and maintenance costs associated with RMW processing equipment, and the availability and cost of contractor services.

18.6.1 Landfill Acceptance of RMW. The designer shall verify that the community landfill(s) will accept RMW, whether treated or in untreated form, and any requirements for its acceptance. See Appendix 18.1 for additional information regarding off-site/contractor disposal.

18.6.2 Off-site Disposal/Treatment Considerations. The Environmental Protection Agency's Medical Waste Tracking Act (MWTA) (reference 18a), while presently expired, introduced a system imposing extensive responsibilities on RMW generators (i.e., hospitals) for the ultimate disposal of RMW, whether by the facility itself or by independent hauling and treatment contractors. It should be anticipated that the majority of State governments have or will institute regulations at least as stringent as the MWTA. In addition to the legal liability implications of waste tracking legislation, the costs and operational complexities associated with contracted disposal will be significant, requiring consideration in cost analysis comparisons with on-site treatment methods. The MWTA was allowed to lapse, although States continue to use it as a minimum guideline to track medical waste.

18.6.2.1 Pathological Waste Disposal. Where other procedures for disposal of human or animal body parts are not feasible or cost effective, off-site pathological waste disposal (incineration or burial) by outside contract with mortician or veterinarian should be considered.

18.6.3 General On-site Treatment Considerations. On-site treatment of RMW is desirable to reduce the potential liability associated with transport of potentially infectious materials and increasingly higher costs for contracted transport and disposal of untreated RMW. Acceptable treatment methods are as defined by the MTWA, requiring waste "treatment and destruction", and renderment to unrecognizability (normally accomplished by

shredding or grinding). The treatment process is required to destroy the potential of the waste to cause adverse human health effects, to pose physical hazards, or to aesthetically degrade the environment.

18.6.4 Treatment Method Selection Guidance. There are significant comparative advantages and disadvantages for each of the RMW treatment currently available in the industry. Waste management and handling regulations have currently not stabilized to the point that a single treatment technique can be recommended to meet the needs of all projects. Table 18.1 outlines technologies which are currently considered effective for on-site RMW treatment. Note that processes used by centralized or commercial facilities, such as irradiation and thermal inactivation treatments for large volumes of liquid and solid RMW, are not presented here.

18.6.4.1 Shredding and Grinding Equipment. In and of themselves, shredding or grinding processes do not constitute treatment methods. Shredding or grinding equipment must be used in a manner which does not introduce aerosolized untreated RMW into the air, and complies with OSHA and EPA regulations for employee health and safety.

18.6.5 Retort Steam Sterilization. Retort steam sterilization is a common method of treating RMW by use of saturated steam under pressure to accomplish the complete destruction of all microorganisms. Use of a retort steam sterilizer, in concert with a grinder for rendering the treated RMW "unrecognizable", makes this process viable in the anticipated regulatory climate. Grinding should be done following sterilization, in conjunction with a compactor or container located at the soiled dock.

18.6.5.1 Limitations of Method. Aesthetic considerations, and the dense nature of human and animal body parts which preclude thorough steam penetration, make sterilization ineffective for this application. Similarly, sterilization cannot be effectively utilized for large volumes of liquids, or animal bedding.

18.6.5.2 Sterilizer Type. Vacuum sterilizers process RMW more effectively, and in less time, than gravity displacement units, and should be utilized for this application.

18.6.5.3 Mechanical Cart Dumper. Systems which employ a mechanical cart dumper to transfer bagged RMW from the holding cart to the sterilizing cart, or use the same cart for collecting, holding and sterilizing RMW, should be utilized to reduce the potential for injury or contamination of waste handling personnel.

18.6.6 Incineration. Incineration was a primary method used to treat and destroy RMW in past years when the plastics content of the waste was low. Higher air quality standards and increased public concerns regarding air emissions have resulted in difficulties with permitting and operation of incinerators, as well as increasing capital and operational costs substantially. On-site incineration should not be considered.

18.6.7 Microwaving of RMW. This is accomplished by a technique which shreds the waste and uses magnetrons, or microwave generators, to produce heat. Microwaving is not suitable for treatment of large pathological wastes, such as body parts and animal wastes. In addition, the technology is currently restricted to treatment of RMW which is less than 10% liquid content by total weight, and metallic content of less than 1% by total weight (with no piece of metal exceeding a weight of 0.5 lb). Advantages of microwaving systems are their effective destruction of RMW and reduction of waste volume by 80 percent.

18.6.8 Chemical Disinfection. Chemical disinfection of RMW is generally accomplished by a technique which uses shredding and a sodium hypochlorite solution to chemically alter and destroy microorganisms. Shredding occurs within the unit, therefore precluding the need for a separate shredding or grinding device. Chemical disinfection is not suitable for treatment of large pathological wastes, such as body parts and animal waste. This technology will typically reduce waste volume by 80 percent.

18.6.9 Liquid RMW Disposal. Discharge to the sanitary sewer is a common practice for disposal for liquid RMW, such as blood and suction fluids. This practice should specifically be reviewed for code acceptability at the time the medical facility is expected to be operational.

18.6.10 New RMW Treatment Technology. Any "new" treatment technologies considered for utilization in facilities shall be acceptable by the regulating authority, have scientific evidence of efficacy, and shall have been successfully in use in similar applications for a minimum of two years.

8.7 SPECIAL REQUIREMENTS FOR HAZARDOUS WASTE. All HW must be contained, identified, stored, and disposed of in accordance with reference 18b.

18.7.1 Holding (Accumulation) Quantities. The volume of HW which a facility may hold is determined by the "Generator Status" of the facility, as defined by the EPA. More stringent State or Local regulations may apply. See Appendix 18.2 for additional information regarding Federal/State guidelines.

18.7.1.1 Large Quantity Generators. Large Quantity Generators produce over 1,000 kg (2,200 lb) of HW per month, or five and a half (5.5) 55 gallon drums. Additionally, if more than 1.1 kg/month (2.5 lb/month) of any "acutely hazardous waste" is generated, the facility is classified under this category. HW storage can not be longer than 90 days from the accumulation start date (normally when the container is full), without a permit. A Large Quantity Generator can have multiple satellite accumulation points at the work place for one (1) container, up to the maximum size of a 55 gallon drum.

18.7.1.2 Small Quantity Generators. Small Quantity Generators produce from 100 - 1000 kg (220 - 2,200 lb) per month. HW storage can not be longer than 180 days from the accumulation start date (normally when the container is full), without a permit. If the disposal facility is located more than 322 km (200 mi) away, HW can be accumulated for 270 days.

18.7.1.3 Conditionally Exempt Small Quantity Generators. Conditionally Exempt Small Quantity Generators produce less than 100 kg (220 lb) of HW/month.

18.7.2 HW Container Requirements. HW must be placed into compatible containers which are sealed at all times except when additional amounts of HW are being introduced. HW containers shall be properly labeled. Stacking of HW containers is allowed only if adequate means are provided to prevent spills or damage to the containers: appropriate secondary containment capability is required.

TECHNIQUES FOR TREATMENT OF REGULATED MEDICAL WASTE			
Types of RMW	Retort Sterilization	Microwave	Chemical Disinfection
Isolations Wastes	Yes	Yes	Yes
Cultures & Stocks Of Infectious Agents & Associated Biologicals	Yes	Yes	Yes
Human Blood & Blood Products	Yes	Yes (4)	Yes
Pathological Waste	Yes (2)		
Used/Unused Sharps	Yes	Yes	Yes
Contaminated Animal Carcasses, Body Parts & Bedding			
Other Wastes Mixed In With RMW	Yes	Yes	Yes

1. Discharge to sanitary sewer for treatment in municipal sewerage system provided that the secondary treatment is available.

2. For aesthetic reasons, steam sterilization should be followed by incineration of the treated waste or by grinding, in accordance with the National, State and Community regulations.

3. Handling by a mortician (burial or cremation.

4. Limited to 10% moisture by weight and 1% metallic content by weight.

TABLE 18.1 TECHNIQUES FOR TREATMENT OF RMW

REFERENCES:

18a Environmental Protection Agency (EPA) Regulation 40 CFR 261-265 implementing the Resource Conservation and Recovery Act (RCRA), 42 USC 6973.

18b EPA Regulation 40 CFR Parts 22 and 259, the Medical Waste Tracking Act.

18c Department of Transportation (DOT) Regulation 49 CFR 171-181, Hazardous Materials Transportation.

18d DOT Regulation 49 CFR 173.386, The Etiologic Waste Act (EWA).

18e Occupational Health and Safety Administration (OSHA) Regulation 29 CFR 1910.1200.

18f OSHA Regulation 29 CFR 1910.134.

18g OSHA Regulation 29 CFR 1910.1030.

Appendix 18.1 - Off-site/Contractor Disposal

Biomedical waste disposal contractors provide a variety of services depending upon the needs of the facility. These services include:

Inspection services: On-site inspections to ensure the facility that they are following all applicable federal, state, and local administrative codes. Typically service providers notify the client when any changes occur in administrative codes.
Waste Plan: Facilities are provided with a Biomedical Waste Plan customized for each facility that is served and usually provided as part of the service.
Training: Facilities are typically provided with a Biomedical Waste Training Manual tailored to the facility served. Providers generally conduct training sessions as part of the service.
Consulting services: Most service companies have specialists trained by OSHA to conduct inspections to help facilities comply with OSHA's Occupational Exposure to Bloodborne Pathogens (29 CFR 1910.030). These services are usually provided at an additional cost to the facility.
Emergency services: Service providers are generally equipped to handle biohazardous spills that may occur that facility staff are not equipped or trained to handle. These services are usually provided at additional cost to the facility.
Supplies: Service providers always carry a full line of biohazardous waste containers, sharps containers, sterilization solutions, paper products, cleaning products, and certain types of medical supplies.

Biomedical waste disposal contractors are usually licensed by the state in which they operate and all have to comply with applicable Department of Transportation regulations concerned with the transport of hazardous or biohazardous waste.

Costs vary according to locale, licensing requirements and distance to the disposal site. Typical costs are:

Sharps containers (reusable): $70.00 – 150.00 per year depending upon volume (including pick-up, disposal and return)
Medical waste disposal: $.18 - .25 per pound
Disposable containers: $1.00 – 1.25 (container only)
Disposable containers: $17.00 – 20.00 (including disposal)

Off-site/contractor disposal is an attractive option in that contractors provide all the necessary paperwork to track regulated medical waste "from cradle to grave." Also, contractors can provide valuable and reliable training, information, inspection and emergency services.

Appendix 18.2 - Federal/State Guidelines

CFR40 Part 60: Protection of Environment

On August 15, 1997, the EPA Administrator signed the final standards and guidelines to reduce air pollution from incinerators that are used to burn hospital waste and/or medical/infectious waste (MWI). These final standards apply to "existing MWI's" built before June 20, 1996 and "new MWI's" built after June 20, 1996. These standards are expected to reduce air emissions from MWI's by 75 to 98 percent from levels existing at that time. These final standards supply to "existing MWI's" built before June 20, 1996 and "new MWI's" built after June 20, 1996.. Additionally, these final guidelines are for use by States in developing plans to reduce air pollution from new and existing MWI's and are only minimum standards. These revised guidelines mean

that any new incinerators will probably be built by large commercial concerns or regional hospital systems, and not individual healthcare institutions.

EPA expected the final standards and guidelines to result in a discontinued use of as many as 50 to 80 percent of the almost 2,400 existing MWI's. Also, due to the increased cost of on-site incineration under the final rules, few health care facilities are likely to install new MWI's. Instead, they are likely to switch to other methods of waste disposal such as off-site commercial waste disposal or on-site disinfection technologies.

EPA based the emission limits for existing MWI on stringent air pollution controls known as maximum achievable control technology. In order to meet the new limits most existing MWI's will need to install add-on pollution control systems, most likely scrubbers.

Outlook

On June 24, 1998, the American Hospital Association (AHA) and the U.S. Environmental Protection Agency (EPA) jointly signed a "Memorandum of Understanding" (MOU) that calls for the elimination of hazardous chemical mercury from the waste stream by the year 2005. In addition, the MOU calls for initially reducing the total volume of all types of waste generated in hospitals and health systems by one third by 2005 and ultimately by half by the year 2010.

Under the collaboration, the EPA and AHA have agreed to:

- Undertake collection of baseline data on hospitals' pollution prevention efforts;
- Monitor hospitals' success in meeting goals of reducing waste;
- Sponsor educational seminars about waste management and mercury reduction;
- Participate in an Environmental Leadership Council, a group comprised of hospital leaders, EPA officials, environmental groups, and others that will provide recommendations to the AHA about educational and outreach activities to hospitals, health systems and health care workers to help reach these waste reduction goals; and
- Develop Internet-based model waste minimization plans for hospitals targeted at specific chemicals.

As a result of these kinds of initiatives undertaken by the government and private institutions, any design criteria should take into account current efforts to reduce medical waste. Obviously, the reduction of medical waste could impact the required area needed for the processing of regulated medical waste and hazardous waste such as mercury. Additionally, economic benefits of the reduction of waste streams from hospitals not only affect operating costs but could beneficially impact construction costs.

State Guidelines

State guidelines generally provide generic guidelines for the training of waste handling personnel, labeling, transport, treatment and policies and procedures. However, California Health and Safety Code (Section 118275-118320) outlines stringent standards for the storage of biohazardous waste or regulated medical waste.

California guidelines require that "if a person generates 20 or more pounds of biohazardous waste per month, the person shall not contain or store biohazardous or sharps waste above 0° Centigrade (32° Fahrenheit) at any onside location for more than seven days without obtaining prior written approval of the enforcement agency."

Also, the regulation provides for more frequent removal of biohazardous or sharps waste stored at a facility if odor becomes a nuisance.

When designing waste handling facilities located in California if storage times of seven days or more are contemplated the inclusion of refrigeration should be considered.

Attachment 1
Incineration

With the August 1997 changes to CFR 40 Part 60 (See comments under Federal/State Guidelines) EPA expects the new standards to apply to between 10 and 70 new medical waste incinerators by the year 2002. Additionally, these final air emission guidelines are for use by States in developing State plans to reduce air pollution from existing and new medical waste incinerators and are only minimum standards. States could impose even more stringent standards while meeting the intent of the law.

These revised guidelines mean that any new incinerators will probably be built by large commercial concerns (Browning Ferris Industries – BFI, Med-ex, etc.) or regional hospital systems and not individual health care institutions.

Attachment 2
Medical Waste Treatment Technology

Current viable solid medical waste treatment methods include retort sterilization, incineration, microwave, and chemical disinfection (see Table 18-1, Mil-Hdbk-1191, Chapter 18). Microwaving would be the preferred alternate treatment method due to the lack of emissions and economy of treatment. Costs for microwave treatment average $.06 - .10 per pound (not including capital cost) versus $.27 - .30 per pound. However, a unit designed to treat 600-900 pounds per hour costs $650,000 (not including installation) and has dimensions of 24 feet long, 9 feet high and 11 feet wide (not including operating space).

With emphasis being placed on medical waste reduction (see Appendix 18.2: Federal/State Guidelines concerning "Memo of Understanding" between the Environmental Protection Agency and the American Hospital Association) the potential volume reductions would extend any payback period beyond a reasonable economic life.

BIOMEDICAL WASTE TREATMENT TECHNOLOGIES

Technology	Approximate Treatment Cost[1]	Approximate Capital Cost	Approximate Space Requirements[2]
Microwave	$ .06 - .10/lb	$425 – 650 K	>1500 SF[3]
Autoclave	$ .06 - .10/lb	$100 – 250 K[4]	>1500 SF
Chemical	$ .03 - .06/lb	$75 – 1450 K	>1500 SF

[1] These do not include transportation and landfill costs.
[2] These requirements are for equipment and working space. Final requirements should be determined after volume estimates are determined and transport method has been determined.
[3] Height requirements vary with the dumping method used (top loading vs. side loading).
[4] These costs do not include a shredder which would be required for any installation.

On-site treatment should be considered when the annual capacity exceeds approximately 500,000 pounds of regulated medical waste. Otherwise, off-site treatment by commercial methods should probably be used. In view of current efforts to reduce medical waste, on-site treatment should only be considered after all conservation efforts have been considered.